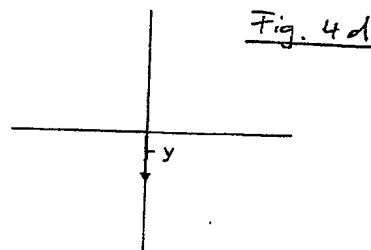
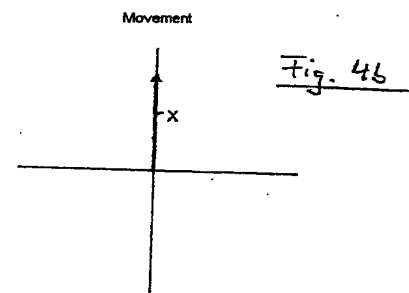
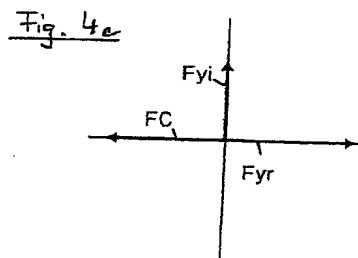
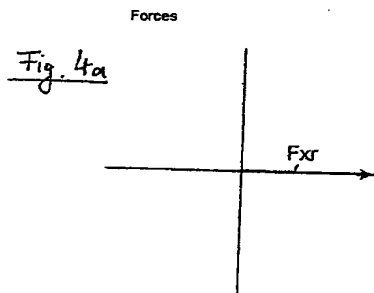
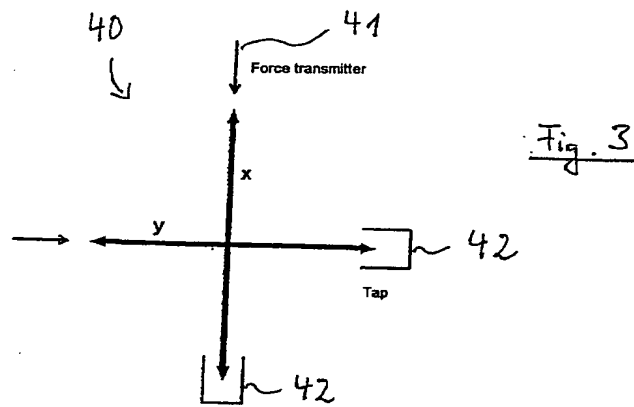


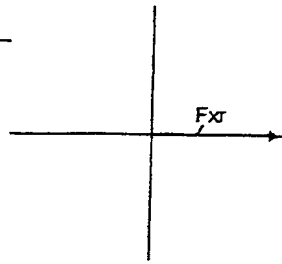
Fig. 1

The diagram illustrates a PLL system with two feedback loops. The main components and their interconnections are as follows:

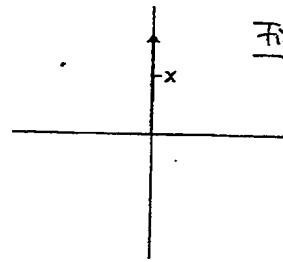
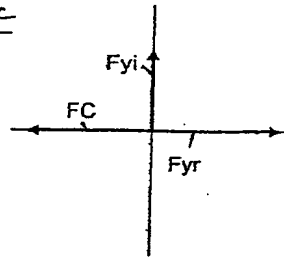
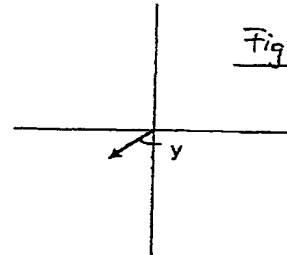
- Reference and Frequency Control:** A reference signal (1) is input to a VCO (10). The VCO output is divided by a frequency divider (3) and fed back to a frequency regulator (14). The frequency regulator also receives a feedback signal from the output (23) and controls the VCO.
- Modulation and Resonance:** The VCO output is also fed into Modulator 1 (11). The output of Modulator 1 is summed with Noise 1 (5) and fed into Resonator $X1=R1(F)$ (12). The output of Resonator $X1$ is summed with Noise 2 (6) and fed into Resonator $X2=R2(F)$ (13).
- Demodulation and Filtering:** The output of Resonator $X2$ is fed into four demodulators: Demod 1 (8), Demod 2 (12), Demod 3 (16), and Demod 4 (20). Each demodulator output is filtered by a corresponding low-pass filter (LP1, LP2, LP3, LP4).
- Control and Output:** The outputs of the low-pass filters are fed into a rotation rate regulator (17) and a quadrature regulator (18). The rotation rate regulator controls the VCO. The quadrature regulator controls the frequency divider (3). The output of the system is the sum of the VCO output and the output of the rotation rate regulator (23).
- Feedback and Resonance:** The output (23) is fed back to the frequency regulator (14) and the rotation rate regulator (17). The rotation rate regulator also receives a feedback signal from the output (23) and controls the VCO.



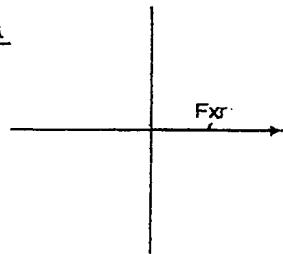
forces

Fig. 5a

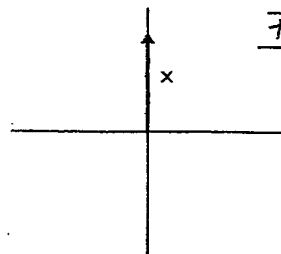
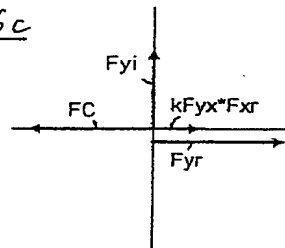
movement

Fig. 5bFig. 5cFig. 5d

forces

Fig. 6a

movement

Fig. 6bFig. 6cFig. 6d